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## EMPIRICAL LOGIC.

*The Principles of Empirical or Inductive Logic.* By John Venn, Sc.D., F.R.S., Fellow and Lecturer in the Moral Sciences, Gonville and Caius College, Cambridge. (London: Macmillan and Co., 1889.)

THOSE familiar with Dr. Venn's previous logical writings felt sure that his new contribution would at least be something very different from an ordinary text-book. There is a novelty, perhaps something of a quaint peculiarity, in the manner of viewing and illustrating his subject, which gives to the author's works an appearance of originality which might be easily confused with that which is due, as in the case of such a treatise as Mill's "Logic," to a radically new conception. And to say this in these days, when logical text-books are multiplied, and, as some would think, all the old problems have been finally threshed out, is no small praise. In the less frequently explored fields already traversed by Dr. Venn—the logic of probability and symbolic logic—there was, of course, more room for such fresh treatment. This freshness is, however, just as conspicuous in the new treatise, which goes over the well-trodden ground of common logic. If anybody is stupid enough to think that logic is necessarily a dry subject, he may be recommended to look into Dr. Venn's last treatise. It is brim-full of shrewd observation, of apt illustration taken from the least conventional sources; more than this, it has humour, and it has fancy—a logician's, of course, but of a genuine quality.

In his general stand-point the author is, as the title of his book tells the expert, and as he fully discloses in his introductory chapter, not far from that of Mill. That is to say, he is an out-and-out materialist. Logic is not, as the formalist says, concerned only with the mind's thought and its normal forms, but occupies itself about the relation of this thought to objective fact or existence—that is, about objective truth. Hence here, as with Mill, we find the reference to reality running through the whole treatment of the subject. This emphasizing of the objective aspect is made sufficiently plain by the fact that, in his first chapter, before taking up the common topics, terms, propositions, &c., he deals at great length with the "physical foundations of inference," the assumptions with respect to the nature of the external world with which the logician sets out. In some directions, indeed, Dr. Venn carries this objective reference further than Mill, and with good results. Particularly valuable is the account of the meaning of reality or objective truth in the case of fictitious ideas, as "dragon." At the same time, our author is very far from making logic a purely objective science in the sense in which the physical sciences are objective. Having to give an account of and to provide rules for inference, it must at every step take into account the subjective aspect as well. Thus it has to consider facts so far as they are known, and, whilst it insists that names are representative of real things, it no less clearly contends that these names sum up and embody the amount of knowledge we happen to possess of the realities at any particular time. The steady grasp of

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this twofold aspect of the subject-matter of logic gives Dr. Venn a great advantage in the treatment of details. This is strikingly illustrated in his whole account of the connotation of names, and the related subject, definition. What a common name, e.g. "gold," means is of course a group of qualities known to exist in certain real things; but a glance shows us that these are not all the qualities that exist in the things, but only a certain portion of these conventionally selected. So again, in dealing with hypothetical propositions, the author turns his recognition of the double aspect to good account. A hypothetical statement, of the form, "If the summer is hot, the supply of water will be diminished," has at once a reference to clear objective fact, and to the mind's doubt or ignorance. The mind's attitude of doubt is seen in the very form of the supposition, "If the summer is hot," the objective certainty reveals itself in the inference confidently drawn from the supposition. One may add that it is this same just recognition of the equal rights of subject and object in logic which accounts for his taking a more modest view of induction than Mill. He tells us in his preface that the title "Empirical Logic" is intended to show that "no ultimate objective certainty, such as Mill, for instance, seemed to attribute to the results of induction, is attainable by any exercise of the human reason." Mill's confident repose on a system of universal law has been rudely handled by writers like the late Prof. Green, who denied his right to reach such universality on his purely empirical or Humean basis. And now we have scientific men like the late Profs. Clifford and Jevons, and Dr. Venn, urging from Mill's own empirical stand-point that experience can never guarantee such perfect universality.

In the case of a work like the present one it is difficult for the reviewer to give, by means of a few typical references, the scope and gist of the argument. As already hinted, it is not in any sense a new logical system. Indeed, it can hardly be called a complete system at all. It does not take us in an orderly, systematic manner through all the well-recognized divisions of the subject. Thus a large part of the domain of the common syllogistic logic is very slightly dealt with, if at all; no reference being made to the so-called laws of thought, or the axioms which underlie the thinking process so far as this is merely self-consistent. Nor even if we view it as a treatise on inductive logic can Dr. Venn's work be called complete, since some of the most important matters appertaining to induction—for example, experiment in relation to observation, the deductive method, scientific hypothesis—are altogether passed by, or only just referred to. In fact, Dr. Venn's volume, which he tells us embodies the substance of courses of lectures, must be regarded as a series of discussions of some of the more important or more neglected points of logic, having a certain connection from the fact that they imply one *manière de voir*, and the same fundamental principles. This being so, one must try to indicate the quality of the work by a reference to one or two of the more important matters dealt with.

To begin with the first chapter, which is an excellent compact statement of the main pre-suppositions of material logic, Dr. Venn has done good service in showing how much work of the mind has gone to the construction of the world of objects with which the

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logician sets out. All that he says here about the work of analysis and synthesis might perhaps be translated by a Kantian or even a Hegelian into his own philosophical dialect. What our author, however, is concerned to bring out is the practical motive that underlies our common thought-distinctions. He shows in a striking manner that there is something arbitrary in our way of demarcating "things" or "objects," though this is justified by practical exigencies. The recognition of this elasticity in our conception of a thing enables the writer later on to handle with good effect the common distinction between concrete and abstract terms. These, says our author, are not absolute, but relative designations. "Hardly any object, as objects are regarded by us, can be selected, which is not to some extent a product of our powers of abstraction, and the more or less of this faculty called into play in any particular case hardly warrants us in labelling the instances respectively with such distinct designations."

Somewhat similar considerations are applied to collective terms. "There is nothing," writes Dr. Venn in his most ingenious vein, "to hinder us from taking a 'scratch lot' of things, to use the slang phrase, and giving a name to the lot with the caprice which we show in naming a yacht or a dog," *e.g.* the persons who happen at a particular moment to be in a given space in Fleet Street. This idea of the arbitrary limits of our common distinctions is made good use of in the treatment of the relation of the subject and predicate in propositions where, as too rarely happens in English works on logic, adequate recognition is taken of impersonal propositions. With reference to this last topic, however, it should be said that Dr. Venn's treatment, though fresh and suggestive, is hardly adequate. He seems to start from the supposition that logicians resolve all forms of predication into attribution of qualities to things (the subjects). This is to ignore the careful analysis of the import of propositions carried out by Mill, Bain, and others.

In a work on inductive logic the mode of dealing with causation may be said to be conclusive as to the writer's competence. Dr. Venn's account forms one of the most valuable portions of his work. Very happy and fruitful in simplification and the dispelling of confusion is his idea that the logician in dealing with the relation of cause and effect stands midway between the point of view of every-day practical sense and that of a rigorously scientific or speculative intelligence. The popular view is practical, and is subordinated to the production of (desirable) effects. The logician improves on this, first of all by enumerating the antecedents more completely, and secondly by "screwing up the cause and effect into close juxtaposition,"—that is, into an approximately immediate sequence. At the same time, he does not aim at absolute completeness in either respect, for this, as the writer shows, would be to defeat his end. He retains something of the popular practicality of view, and this is ingeniously illustrated in the common logical doctrine that, whereas the same antecedent can only be followed by one consequent, the same consequent can be preceded by different antecedents (plurality of causes). Perhaps Dr. Venn is a little hard on Mill and logicians generally for their way of formulating the causal re-

lation. No doubt, as he contends, every concrete event is a highly complex group of elements, followed by another complex group. But the logician is dealing with causation for purposes of induction. He assumes that the investigator must generalize, and generalize as far possible, if he wishes to attain his goal, *viz.* comprehensive principles or laws. A general statement, such as "Friction produces heat," is, no doubt, in a sense highly elliptical. There must of course be, in every case, a definite set of circumstances in which the friction acts and the heat is developed. But there is no need to refer to these in stating the general truth; on the contrary, this statement, just because it is a large principle available for guidance in a vast number of diverse cases, must be an abstraction. Historically considered, moreover, it may be said that Dr. Venn makes too much of the practical impulse in the genesis of our idea of causation. Primitive man, as soon as he could form an idea about cause at all, was presumably already beginning to ask about the origin of things, and to work out a crude cosmogony of his own.

On the nature of inductive processes, and the well-known methods formulated by Mill, our author is distinctly in advance of his predecessors. With his customary caution he points out the difficulties that have to be got over before generalization can begin. Combining in a manner the views of Mill, Whewell, and Jevons, he regards a complete process of inductive discovery as consisting of three steps, *viz.* (1) a stroke of insight or creative genius in order to detect the property to be generalized (and possibly also the class); (2) the formal process of generalization; and (3) the final stage of verification (apparently by way of deduction). The chapter on the methods is judiciously critical, and may with advantage be compared with Mr. Bradley's less discriminating treatment. The way is prepared for a study of the complex problems of physical induction by the selection of a simple artificial example, *viz.* the case of a man in an hotel office, who has to determine what room rings a particular bell. This case is dealt with by purely formal considerations, similar to those which guide us in the problems of symbolic logic. It is then shown that such purely formal treatment is inappropriate in the case of physical investigations, and the special methods of induction are thus introduced as a *pis aller*. The author is most original in dealing with the Joint Method, which every careful reader of Mill's "Logic" must have felt was very far from clear.

There are other features in Dr. Venn's scheme of induction which deserve careful notice. Among these may be named the account of co-existences as distinguished from sequences (chapter iii.); the description of the nature and function of units and standards (chapters xviii. and xix.), which is less technical and more suitable to a logical treatise than that given by Jevons; the highly characteristic chapter on the possible extension of our general powers of observation (chapter xxiii.), where the bold idea is entertained of our being able some day to spread out an event in time just as the telescope and the microscope enable us to spread out an object in space; and, lastly, the discussion in the concluding chapter of the effect of our practical tendencies in modifying a strictly logical or speculative view of the world.

Any one of these might well call for detailed remark if space permitted. They show the author at his best, finely observant of overlooked points, subtly ingenious in devising new, quaint, and even startling possibilities. But the reader must be referred to the volume itself for a fuller appreciation of these qualities.

When one has gained much pleasure and profit from a work, it seems almost shabby to begin to find fault. Yet no critical reader of Dr. Venn's treatise can fail to perceive its defects. It is as if the author had boldly set them before our very eyes challenging criticism. The want of close connection has already been touched on. There seems, indeed, a surprising lack of systematic arrangement, as if the author had sat down to write without a clear plan before him. Poor formal logic gets badly treated. Thus we have an account of terms, propositions, including hypotheticals and disjunctives, but no account of the syllogism. Nor can it be said that the writer has introduced just as much of the common syllogistic logic as is needed for setting forth the processes of induction. Much given us under terms and propositions cannot well be regarded as needed in a treatise on the logic of induction. Sometimes, indeed, the author wanders into the mystic region of symbolic logic. Again and again he opens up in a tantalizing way views which he does not stop to establish. One may instance the point touched on (p. 43), whether the converse of a particular proposition is in substance a new proposition. This depends on our view of the import of a proposition, which, as already pointed out, is not adequately dealt with. Again, the author seems to deny the existence of a negative disjunctive of the type "Either A is not B or C is not D," but he does not trouble to prove the point, or indeed to make clear what he precisely means. It is surprising, again, to find Dr. Venn discussing the functions of the syllogism not only without giving any preliminary sketch of it, but without the barest reference to the nature of the axiom which underlies it. On the other hand, a good deal that is known to the general student from previous works (including the author's own) is needlessly repeated, and helps sadly to swell the size of the volume. Another feature that will strike every careful reader, and which is strongly suggestive of defective plan, is the frequency of the forward reference, as "we shall see by and by," and so forth. This is apt to be very confusing. In noting this, together with the comparative infrequency of the backward reference, one cannot help thinking of the author's remark on the popular view of causation, that it looks forward rather than backward.

A number of the author's statements seem to the present writer open to dispute. It must be surely a slip which makes him write of the classifications of natural history as made up of *collective* terms (p. 170). The Dicotyledons are surely not a collection in the sense in which the House of Commons is a collection. The limitation of the denotation of terms to present existences (p. 179) strikes one not only as highly capricious, but as inconsistent with what is said about differences of time in connection with predication. Once more, one would like to challenge the strong statement that the only easily discoverable instance of a purely verbal dispute is that about the "sameness" of a thing (p. 296). In one place, at least, the writer's ingenuity seems to carry him too far.

Writing of logical definition by genus and differentia (p. 302, by a slip written genus and species), Dr. Venn tries to show that this is perfectly rational on the supposition (which logic is bound to make) that we all know the meaning of our terms, or, since the very need of defining a term shows that there is one term of which this cannot be supposed, of all terms but one. But it is obvious that this consideration would equally suggest or justify an inverse process of definition, viz. by naming a lower species, and subducting its differentia. Such slight blemishes as these are probably inseparable from Dr. Venn's manner of work, and it can safely be said that they detract but little from the general and lasting impression of masterful competence which his volume is certain to leave on the student's mind.

JAMES SULLY.

#### REMSEN'S "INORGANIC CHEMISTRY."

*Inorganic Chemistry.* By Ira Remsen, Professor of Chemistry in the Johns Hopkins University. (London: Macmillan and Co., 1889.)

THIS book is of interest from the circumstance that it is the first of its kind in the language of any pretensions which is based upon the periodic law. It is further characterized by the fulness with which general relations are discussed. The attempt is made to present the facts of inorganic chemistry in such a manner as to bring out their analogies and connections, with a view of elucidating the broad general principles of the science. Details of experiments, either as showing the origin and modes of preparation of products, or as illustrating their leading properties, are for the most part omitted, or are relegated to an appendix containing special directions for laboratory work. The book is put together in a plain, straightforward manner, with no attempt at any literary airs and graces; indeed, we may add that at times the style verges on a simplicity which is perilously near being puerile. Having said this much in commendation of the general plan of the work, we have said all we can say in its praise. For, however excellent may be the plan of a treatise of chemistry, its main value, after all, must depend upon the accuracy and completeness of its statements; and, as we proceed to show, there is much in this book which is both inaccurate and incomplete. From the style in which it is issued, and its price, we presume that the work is intended for the benefit of comparatively advanced students—at all events for a higher grade than that for which the author's well-known smaller books were prepared. Indeed, we are distinctly informed that the earlier works were intended to form a series of which the present volume is the most advanced member. Now, whilst it may be convenient for the purpose of elementary teaching not to tell the whole of what is known about a thing, the advanced student, if he has any scientific instinct at all, insists on knowing the truth, the whole truth, and nothing but the truth. Unfortunately, he does not always get that from this work. Prof. Remsen is admirable in his introductory books. In these there is a reticence of statement and a subordination of facts which make the books excellent for the purposes of school-teaching. But in the larger book it appears to us that the author suffers from the defects of his excellencies: what is a merit in